IN THE CLAIMS

Claims 1-2 (Cancelled)

3. (Previously Presented) A method of recognizing objects under various lighting conditions comprising:

   (a) providing a database comprising a plurality of three dimensional models,

   (b) providing an input image,

   (c) orienting each three dimensional model relative to the input image,

   (d) determining, for each three dimensional model, a rendered image which is most similar to the input image, said determining step comprising:

      (i) deriving a reflectance function that describes an approximation of the set of all possible rendered images that each three dimensional model can produce under all possible lighting conditions, said rendered images including both diffusely and specularly reflected light; and

      (ii) optimizing the reflectance function to determine rendered image of each model that is most similar to the input image;

   (e) computing a measure of similarity between the input image and each optimal rendered image; and

(f) selecting the three dimensional model corresponding to the optimal rendered image whose measure of similarity is most similar to the input image, wherein the reflectance function employs a broadened-specular reflectance model that accounts for the angle between the direction of observation and the direction of perfect specular reflectance, said broadened-specular reflectance model axially symmetric about the axis of perfect specular reflection.

4. (Original) The method according to Claim 3 wherein the reflectance function includes a mathematical term to account for the absence of reflected light due to the position of the object model.

Claims 5-8 (Cancelled)

9. (Previously Presented) A method of image recognition of an input image, the method comprising:

(a) receiving a three-dimensional model of a candidate object in a particular orientation;

(b) generating a set of harmonic images for the three-dimensional model, the harmonic images forming the basis for a linear subspace, and approximating the specular and scattering reflectance on the candidate object when illuminated by a harmonic light; and

(c) selecting a candidate image from the set of harmonic images, the candidate image representing a point in the linear subspace that is

nearest to the input image, by seeking a vector of harmonic coefficients that minimizes the difference between the input image and the candidate image.

10. (Previously Presented) The method according to claim 9, wherein the candidate image is restricted to a subset of harmonic images that corresponds to physically realizable lighting conditions.

11. (Previously Presented) The method according to claim 9, wherein the linear subspace comprises the first four harmonic images.

12. (Previously Presented) The method according to claim 9, wherein the linear subspace comprises the first nine harmonic images.

13. (Previously Presented) The method according to claim 9, wherein the linear subspace comprises the first eighteen harmonic images.

14. (Previously Presented) The method according to claim 9, wherein approximating the specular and scattering reflectance on the candidate object comprises a term dependent upon the cosine of the angle between the reflected light and the direction of perfect specular reflection.

15. (Previously Presented) The method according to claim 9, wherein approximating the specular and scattering reflectance on the candidate object comprises a term derived from the Phong model of reflectance.